FOREST INSECT SURVEYS - MODOC NATIONAL FOREST

Season Of 1933

(Including the 12th annual survey of the)
(Happy Camp - Lava Beds Area.)

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Berkeley, California
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Season of 1933

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INTRODUCTION

The 1933 annual survey of timbered areas in the Modoc National Forest was conducted as a part of the Emergency Conservation Work program. A crew of four men, acting as facilitating personnel at the Heckamore Civilian Conservation Camp were delegated to perform entomological work under the direction of the Bureau of Entomology.

The entire summer season, lasting from March 28 to October 15 was given over to various phases of work on forest insects. Due to the disruption of the normal course of the infestation by freezing temperatures in December 1932 and February 1933, a study of the actual effects of the low temperatures on forest insect infestations was undertaken. The results of this work have been reported by R. L. Furniss, who had charge of the EC crew. In addition, Mr. Furniss completed brood studies supplementary to those conducted by Person in 1928 and linked definitely with the study of effects of the 1932-33 freeze. A third phase of the work conducted by the survey crew consisted of obtaining data, on which to base future estimates of total seasonal losses, from cruises made during the season of forest insect activity. This material, which will be combined with information obtained by previous cruises, will be reported on in the future. A fourth phase of the work, which occupied the latter portion of the work period, consisted of getting loss estimates for the Happy Camp - Lava Beds area and of two units in the North Warner Mountains as a preliminary step in making control recommendations. This report gives the results of the fourth phase of the season's work.

CRUISING METHODS

In the Happy Camp - Lava Beds area cruises were made of eighteen 320 acre plots and six traverses totalling 8,360 acres or 2.7% of the timbered area. In the North Warner Mountains one 320 acre plot and four traverses totalling 1,120 acres were cruised, making a grand total of 9,480 acres cruised on the Modoc this season. The four man crew, which did the cruising, covered a ten chain strip on all plots and traverses. One man served as compassman-mapper and the other three spotted.

Cruising for insect losses in the Modoc, particularly in the early fall entails examination of practically all trees over 16 inches in

diameter regardless of foliage color. The magnitude of the work can be appreciated when it is estimated that there are 200,000 or more such trees on the cruised area.

GENERAL INSECT CONDITIONS

Cruise results of the work done in the fall of 1932 showed an infestation that, in many areas, was definitely epidemic. Total loss in the various units in the Happy Camp - Lava Beds area was estimated to be as great as that of 1926, and the North Warner areas contained epidemic infestations. It has been shown that the infestation of 1926 was definitely more than halfway advanced to the peak of the epidemic cycle of 1924-29. The 1932 losses showed every indication that the infestation was at about the same point in another epidemic cycle. The western pine beetle brood predominated in the losses, secondary insects being a relatively minor feature of the infestation. The amount of brood in unit samples of bark was found to be much greater than normal and in extremely good health. It was prognosticated that, if the improbable did not happen, the 1933 losses would be much greater and probably at the peak of an epidemic cycle.

However, the improbable did happen and low temperatures in December were estimated from a considerable number of samples to have reduced the western pine beetle population by about 65%. Observations during the spring indicated that, on the average, that figure was low by nearly 30%. Of course, it is evident that a 95% reduction did not occur evenly throughout the area, but it is believed that the average was in that vicinity.

Early spring conditions in the Modoc thus found the western pine beetle population greatly reduced in numbers. Other species, ordinarily considered to play a role secondary to the western pine beetle were not affected proportionally. During the season, the western pine brood developed considerably in importance and greatly in total population. Although, at the beginning of the season, only weak types of infestation by D. brevicomis could be found, the fall work showed many normally infested types of trees and heavy broods. In spite of this, however, the 1933 estimated losses showed considerably difference when compared with those of the two years previous. The following table gives the average losses and the composition of infestation as secured from seventeen half-section plots. The loss figures are on a per section basis.

Year	No. Trees	Vol. B.M.	% Vol. Prev. Yr.	Ave. Vol. B.M.	% D. brev.	% Mixed: Infest.	% Sec. Species
1931	204.5	156,830		770	81.3	9.9	8.8
1932	246.7	200,700	Plus 28	810	76.7	9.1	14.2
1933 Est:	102.6	97,380	Min. 51	950	52.0	27.0	21.0

The increase of 1932 and the drop of 1933 are indicated both by the tree and volume figures. Although the decrease of 1933 was caused largely by the natural factor of low temperatures, it cannot be considered that this year's results are indicative of the natural development of the infestation. If not, the question as to what may follow is in order. From the detailed information secured during the past summer it appears that the decrease can be considered but a temporary setback although it is not possible to forecast a 1934 infestation level higher than that of 1932. The fact remains that the greater portion of the 1933 loss was not attacked until near the close of the active season and for that reason the rapidly increasing infestation may indicate tremendous losses in the 1934 season.

Scrutiny of the average volume figures does not show the usual trend of rising epidemic infestations. It has been noted that, in epidemics, the average volume drops. The setback of the 1932-33 winter season may have caused a reversion to endemic tendencies in tree selection.

The decreasing importance of the western pine beetle in the infestation as well as the compensating increase in the amount of loss caused by other species, usually considered as playing a secondary role, is notable. The large amount of mixed infestation in 1933 is composed chiefly of western pine beetle, flathead borers and mountain pine beetle in combination. The mountain pine beetle, usually a minor feature of infestations in Modoc ponderosa pine stands, has increased greatly in importance during the last season.

INFESTATION IN THE VARIOUS UNITS

The basis for loss estimates in the various units is given under each unit but the total loss estimates appear in Table I. The record of estimated per section losses for the length of our records appears in Figure I, and Figures II and III show the areas covered by the 1933 surveys.

Glass Mountain Unit

Logging by the Long Bell Lumber Company in the better type timber of this unit, which has been mentioned in previous reports as carrying a nearly normal infestation in ordinary years, ceased in 1932. In the fringe type, however, the Shaw Bertram Company continued to log with the result that the Forest Service figures show a total of about 17,400 acres logged off in this unit. Progressive logging of the unit has resulted in the changing of the acreage figures on which estimates are based. There are no data on cut-over losses and accordingly that type of land has been excluded from the calculations.

Infestations in the heavily infested fringe type and in the better

quality stands on the pumice benches have followed the same trends in the past only in general. They apparently are in sympathy at the present time. In 1932 the infestation in the fringe type showed a drop of about 23% when compared with the losses of 1931. Infestation in the better type timber increased in that year and partially compensated for the decrease. Infestation in both types decreased in 1933, that in the fringe type by about 10% over 1932 and that in the better quality timber by about one third.

Data from plots and traverses representing conditions in this unit are as follows. The figures are on a per section basis.

Sample Designation	Location T	R	Sec.	1931 Losses Trees	Vol. B.M.	1932 Losses Trees	Vol. B.M.	1933 Losses (Est.) Trees	Vol. B.M.
R. S. 4	44N	5E	36	826	374,120	624	287,560	416	257,200
Trav. #6	42N	5E						57	39,220

It is worthy of note that the western pine beetle infestation, as indicated by basal cruising examinations, has been a lower percentage of the total infestation on this plot than on most other sample plots in the Modoc Forest. In 1931, 32 and 33 the figures have been computed as 66.0, 61.8, and 42.9% respectively. The traverse showed a western pine beetle infestation of 41.2% in 1933 and the recorded losses are typical of the better quality timber in the unit.

Timber Mountain Unit

No plots were cruised in this unit this year. The many activities of grazing permittees and wood users, in addition to depletion of much of the stand by fire and insects, has reduced the stand to such an extent that there is little need for evaluating the injury caused by insects. The damage to the stand and area by man and his domesticated animals has been so noticeable that there is little to be gained by experimental work in the unit unless it be that designed to determine if the area can remain timbered under such adverse conditions.

The cruise of 1932, which covered a 40 acre plot, showed losses at the rate of 1664 trees and 522.400 B.M. per section. When it is considered that the average volume of the infested trees was only 313 B.M. it can be realized how quickly the number of trees in the area is being reduced. From what is known of the freeze in nearby areas it is expected that a drop of about 35% of the 1932 volume occurred in 1933 and that the average volume of infested trees will be somewhat higher than in that year.

Badger Unit

The control work of 1928, 1929, 1932 and the project of this winter has made it impossible to calculate the losses in this unit on the basis

of natural trends. It is necessary to balance the effects of control work on portions of the unit against tendencies towards a natural increase on other parts of the area. Accordingly, any estimates that can be made must be a matter of judgment of the weight to be given the results of the various untreated and treated plots. The following data is that pertaining to our records on plots in this unit during the past three seasons. The losses are given on a per section basis.

Sample Designation	Location T	R	Sec.	1931 Losses Trees	1931 Losses Vol. B.M.	1932 Losses Trees	1932 Losses Vol. B.M.	1933 Losses (Est.) Trees	1933 Losses (Est.) Vol. B.M.
R. S. 1	43N	7E	22	220	238,320	314	232,970	82	76,950
Hack. #2	43N	7E	27	166	144,360	242	207,640	82	76,220
Hack. #5	43N	8E	10	126	110,700*	88	99,840	28	29,930*
Hack. #6	44N	8E	35	182	155,180*	178	165,160*	58	80,840
Hack. #7	44N	8E	13	178	125,620	264	222,360*	61	61,640
R.S. 5	44N	8E	16	264	170,860*	142	104,350	72	74,540*
Hack. #4	44N	7E	26	128	106,180	338	231,440	206	179,700*
Test #1	44N	7E	25	178	136,700	318	281,300	110	115,000*
Test #2	44N	8E	30	198	176,380*	222	249,400	100	136,170*
Test #3	44N	8E	29	208	164,540*	142	133,940	86	98,070*
Trav. #1	44N	7E						210	155,950*
Trav. #2	44N	7E						172	166,080*
Trav. #3	44N	7E						138	132,230*
Averages 10 plots				184.6	152,884	224.6	192,890	88.5	92,906
% Increase & Decrease of Average.						+26.2			-61.9

* Treated in control project of that year. This symbol applies to results given under other units as well.

It is felt that the averages given above are about right for estimates of the entire unit for 1933. The traverse results were secured from one of the more heavily infested areas and were taken merely to check estimates for control projects.

The trend of the infestation since 1931 shows an increase in 1932 of about 26% of the 1931 infestation and a decrease in 1933 of about 62% of the 1932 infestation. This decrease is almost equal to the reduction caused by the freeze as indicated by the bark counts of last winter. However, it is believed there is no basis for concluding that the similarity of results is anything more than a coincidence, particularly in view of the detailed information secured this last season which showed the present infestation is almost entirely a summer season development.

The western pine beetle infestation on the plots dropped from an average of 79.8% of the total in 1931 to 78.5% in 1932 and 57.3% in 1933. This is an indication of an increase in secondary insect activity.

Happy Camp Unit

This unit, largely privately owned, showed relatively epidemic conditions in 1931 and 1932 in spite of the fact that the incomplete data taken in July, 1931 indicated endemic losses for that year. The data secured from plots in this unit during the past three years is as follows, the figures being on a per section basis.

Sample Designation	Location T	R	Sec.	1931 Losses Trees	Vol. B.M.	1932 Losses Trees	Vol. B.M.	1933 Losses Trees	Vol. B.M.
R. S. 2	41N	6E	18	106	136,620	310	311,690	58	59,380
R. S. 3	42N	7E	28	80	83,280	178	177,160	64	54,220
Mack. #8	42N	6E	15			266	242,260	106	105,520

The percent of infestation caused by western pine beetle, although at a high level of 89.4% in 1931, dropped to 79.3% in 1932 and the low level of 52.2% in 1933. The fact that much of the timber in this unit is of better than average quality for the Happy Camp - Lava Beds area indicates that the tendency for increasing activity by secondary insects and towards mixed infestations is more general than local. Explanation of the 1933 composition of infestation may lie in the effects of the low temperatures on western pine beetle and other species but that would not explain the changes noticeable in the 1932 infestation.

Estimates for the unit are given in Table I. It is seen that, even after an estimated decrease of about 70% in 1933 the loss remains at about 117 B.M. per acre, which is alarming. It is believed, due to the fact most of the cruises were made in September of this year, and that the infestation was increasing rapidly, the estimates may be lower than the losses actually sustained in 1933. A loss of such magnitude in timber of good quality for an east side type area merely emphasizes the necessity for planning to reduce the infestation to a point where it does not result in a net reduction of the stand year after year. This might be done either artificially or by modification of the stands so that they will not be as susceptible to insect attack as at present. The fact that nothing is known of the insect activity in east side type stands following salvage cutting makes it necessary that information be obtained as soon as possible on that phase of the problem.

Lava Beds Unit

The 1931 infestation in a part of this unit was treated early in the spring of 1932. The infestation of the following year, although increasing greatly in some portions of the unit to the north of the treated area,

showed a marked decrease on the treated lands. The net result was a small reduction of the average per section loss. The loss of 1933, estimated from a basis of two plots and three traverse strips, was less than in 1932. The plot figures for the unit, expressed on a per section basis, are as follows:

Sample Designation	Location T	R	Sec.	1931 Losses Trees	Vol.B.M.	1932 Losses Trees	Vol.B.M.	1933 Losses (Est.) Trees	Vol. B.M.
R. S. 6	41N	5E	19	156	122,920*	82	71,160	66	91,860
Hack. #3	43N	6E	12	170	167,300	232	193,460	158	187,960
Trav. #4								52	37,800
Trav. #5								56	42,090
Trav. #6								57	39,220

Plot Hack. #3, located in the north end of the unit, practically on the line between the Lava Beds and the Badger Unit, shows the trends of the more or less fringe type timber of the unit. R. S. 6 shows the trends of the area treated in 1931, which normally has a somewhat heavier infestation than the area north of a line drawn from Round Mountain east to Sugar Pine Ridge. The traverses, showing 1933 losses only, are typical of the central portion of the unit. The normal differences of infestation in the northern, central and southern portions of the unit are illustrated by the figures. In spite of the control work in what may be considered relatively healthy and fast growing timber for the east side type, the average estimated per acre losses have remained above 100 B.M. per acre for the past three years. Considerably higher losses can be considered to have occurred on about half the area of the unit this season, but these are offset to some extent by the heavy losses in the northern and southern portions.

The infestation was 82.1% western pine beetle in 1931, 60.2% in 1932, and 41.5% in 1933.

Pit River Unit

This unit, which has large non-timbered areas and many marginal strips of timberlands within its boundaries, has not been sampled extensively. But one plot, the three year record of which, expressed on a per section basis follows, is the basis for estimates.

Sample Designation	Location T	R	Sec.	1931 Losses Trees	Vol.B.M.	1932 Losses Trees	Vol. B.M.	1933 Losses (Est.) Trees	Vol.B.M.
Hack. #1	41N	8E	4	122	109,880	236	151,120	44	42,260

The infestation composition showed a drop to 32.8% of western pine beetle this season. As a large portion of the unit is fringe type timber,

the proportion of loss caused by secondary insects and mixed brood infestations is ordinarily large although, during epidemic years as much as 93% has been found to be western pine beetle loss.

The few samples from near this area that were counted for mortality of brood due to freezing showed high mortality from that cause. It is not thought that the present situation is alarming, in part due to the type of timber infested. It is probable that our estimates for this year in this unit will prove to be lower than the actual figures.

White Horse Unit

Previously, estimates of loss in this unit have been furnished as a part of the Modoc Surveys. However, logging activities in recent years have affected a considerable portion of the lands carrying stands typically of the Modoc type. Of the uncut timber remaining, the greater portion is of the Lava Bed type of the Shasta National Forest, of which no adequate sample has ever been taken or is more typically a mixed conifer forest of much better quality than is found in the Happy Camp - Lava Beds area. As the plot cruised to furnish the data for estimates in this unit has been cut this season and as the uncut timber is largely no longer of the same type as the Modoc stands, estimates for this unit have not been made this season.

NORTH WARNER MOUNTAIN UNITS

Buck Creek Unit

The low temperatures of 1932-33 did not appear to have affected the broods in this unit to the same extent as those in the Happy Camp - Lava Beds area. However, examination of trees treated in the 1933 spring control project showed that mortality of broods was nearly as great. The infestation in the unit was sampled this year by cruises of one plot and one strip traverse. The results of cruises for the past three years, expressed on a per section basis, have been as follows:-

Sample Designation	T	R	Sec.	1931 Losses Trees	1931 Losses Vol. B.M.	1932 Losses Trees	1932 Losses Vol. B.M.	1933 Loss (Est. Trees	1933 Loss (Est. Vol.B.M.
U.S. 11	46N	15E	5 & 8	170	164,160	284	290,870	54	33,120
Trav. #1								11	9,650

The plot results, which showed only one third of the loss to be caused by the western pine beetle, are low and do not indicate the neces-

sity for control this year. The strip traverse results which, in part represent areas somewhat out of the ponderosa pine type, are indicative of the extremely low level to which the infestation has been reduced in some portions of the unit. It can be considered that the western pine beetle is not very active at present and that the majority of trees are being killed by secondary species of insects.

Sugar Hill Unit

A large portion of this unit has been logged or the timber destroyed by the Sugar Hill Fire. Two traverses in the Lassen and Crane Creek portions of the unit showed nominal losses although it is known that the western pine beetle was fairly active early in the summer on the ridge between the Crom cutover and the Lassen Creek drainage basin. No loss estimate has been made for this unit because of the small area of ponderosa pine type remaining unburned or uncut. Epidemic infestations in this area are easily recognizable and should they occur could be controlled artificially because of the nearby going timber sales.

CONTROL RECOMMENDATIONS

Happy Camp - Lava Beds Area

In spite of the control work of previous years in and near T 44 N, R 8 E, and the general reduction of forest insect population through climatic control during the winter of 1932-33, the infestation in parts of this area built up to formidable proportions during the 1933 season. For this reason a control project was considered for the Badger Unit. The fact that the stands are suffering heavy losses, that previous investments in insect control are involved and that the timber is under sale and easily accessible even though not logged under the present contract, made it desirable to attempt further work.

The control operation of 1931 in the Badger Unit showed conclusively that, under conditions of heavy and rising infestation the patented lands to the west of the Badger Township (T 44 N, R 8 E) furnished a sufficient beetle population for rapid reinfestation of the treated area. The availability of the NIRA funds and the Civilian Conservation Camp personnel for treatment of a limited amount of patented lands for protection of government holdings provided an opportunity for securing adequate entomological boundaries for the project on the west. Thus it is believed that a satisfactory test of the effects of insect control under the conditions existing in the Lava Beds area of the Modoc National Forest could be obtained.

The proposed control projects, now nearly completed, will cover the areas as indicated in Figure II. Ownership of the timber is as follows.

	CCC Project	NIRA Project
Red River Lumber Co.	~~240~~	~~4010~~
Pickering Lumber Co.	9,640	5,520
U. S. Government	6,010	14,200
Total Area	16,320	23,760

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About 2,750 trees and 2.5 million board feet will be treated on the CCC project and about 3,500 trees and 3.5 million board feet will be treated on the NIRA project.

Although losses in other areas are high enough to result in net losses in the stands, the situation in those areas does not appear to be as critical, the date of utilization does not appear to be as definite, and there are no previous control investments as occur in the Badger Unit. Accordingly, no other control projects have been recommended for this season even though estimated losses for 1933 fall below 100 bim. per acre only in the Pit River Unit.

Thoughts have turned toward salvage logging to control infestations of the type existing in the Happy Camp - Lava Beds area. However, much work still remains to be done on study of the losses in virgin timber in order that the more susceptible types of trees may be determined. In addition, studies of the losses in cutover areas are necessary before definite recommendations concerning this type of control can be made. It is expected that the several phases of this problem can be undertaken and at least partially completed within the next few years.

North Warner Mountain Areas

No control is recommended for those areas. The infestation appears to be at a relatively low level for the type of stand and area involved. Nevertheless, losses remain fairly high when compared with those in more vigorous stands in other parts of the region.

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SUMMARY

The 1933 survey work conducted by the Bureau of Entomology through the Civilian Conservation Camp organization resulted in the securing of data by sampling about 325,000 acres of timberland in the Modoc National Forest.

The more important points concerning the 1933 infestation that were brought out by the survey work are as follows:

1. The western pine beetle population was greatly reduced by climatic controls during the winter of 1932-33. Other forest insect species were not affected to as great an extent.

2. D. brevicomis brood was weak at the start of the 1933 season of activity. A remarkable recovery of vigor of brood and of population was exhibited by that species during the summer season, the late seasonal activity resulting in marked increases in timber losses.

3. The composition of infestation in the 1933 season is radically different from other years. Pure western pine beetle attacks average but 55% of the total, while mixed broods, flathead and mountain pine beetle infestations are much more abundant than is normal.

4. Losses of 1933 are estimated to be but one half of those of 1932. However, the average per acre loss is about 134 b.m. in the Happy Camp-Lava Beds area and only in the Pit River Unit have losses been estimated to be below 100 b.m. per acre.

5. A control project covering about 40,000 acres has been recommended for the Badger Unit. This is now nearly completed and covers patented as well as government timber. It is expected the boundaries of this project will be more satisfactory than those of previous control projects in the area, particularly in preventing reinfestation from outside the treated area.

6. No other control projects are recommended for the forest in spite of heavy losses. Reasons for this action lie in the lack of previous control investment, less certain data of utilization and less critical infestation conditions.

TABLE I

ESTIMATED PER SECTION AND UNIT LOSSES

MODOC NATIONAL FOREST

UNIT	Acres Virgin Timber 1933 (1)	1931 LOSSES				1932 LOSSES				1933 LOSSES			
		Per Section		Per Unit		Per Section		Per Unit		Per Section		Per Unit	
		Trees	Vol. B.M.	Trees	Vol. MB.M.	Trees	Vol. B.M.	Trees	Vol. MB.M.	Trees	Vol. B.M.	Trees	Vol. MBM.
Glass M tn.	53,180	423	254,300	41,870	25,130	258	135,850	23,860	12,570	179	112,400	14,880	9,340
Timber Mtn.	1,600	840	287,000	2,530	960	2300	739,200	5,770	1,950	960	484,000	2,400	1,200
Badger	88,070	134	117,580	13,370	16,170	225	193,000	30,980	26,560	92	93,000	12,660	12,800
Happy Camp	66,370	127	130,380	13,220	13,550	251	243,700	26,030	25,270	76	75,040	7,880	7,570
Lava Beds	71,670	120	99,600	13,560	11,360	110	95,680	12,320	10,710	78	79,990	8,740	8,960
Pit River	31,870	65	46,990	3,120	2,340	153	113,340	7,620	5,640	44	42,260	2,190	2,100
TOTALS	312,760			92,670	69,310			106,580	82,600			48,750	41,970
Ave.B.M. per acre					221				264				134

(1) Excluding nontype, cutover and burned areas.

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HAPPY CAMP - LAVA BEDS AREA

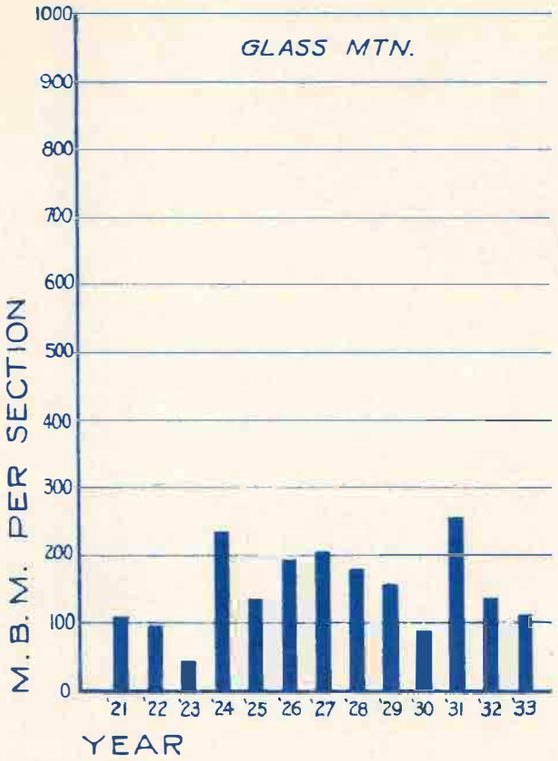
MODOC NATIONAL FOREST

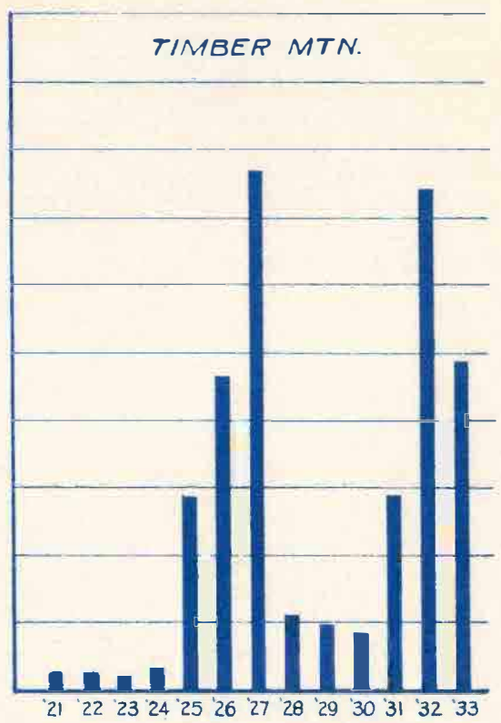
CALIFORNIA

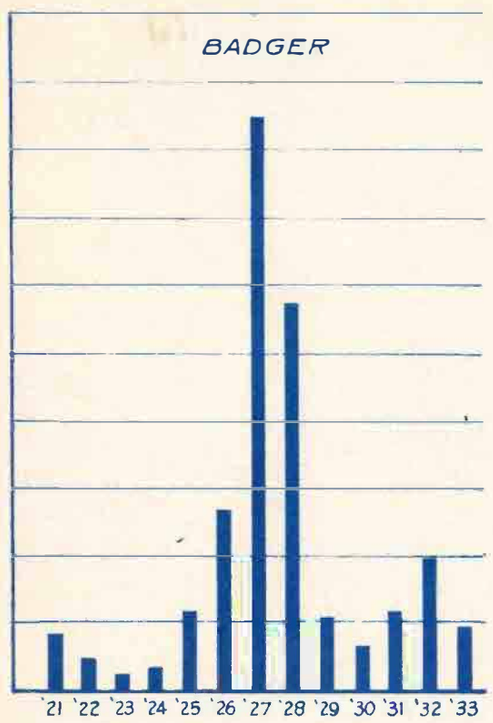
INSECT LOSSES

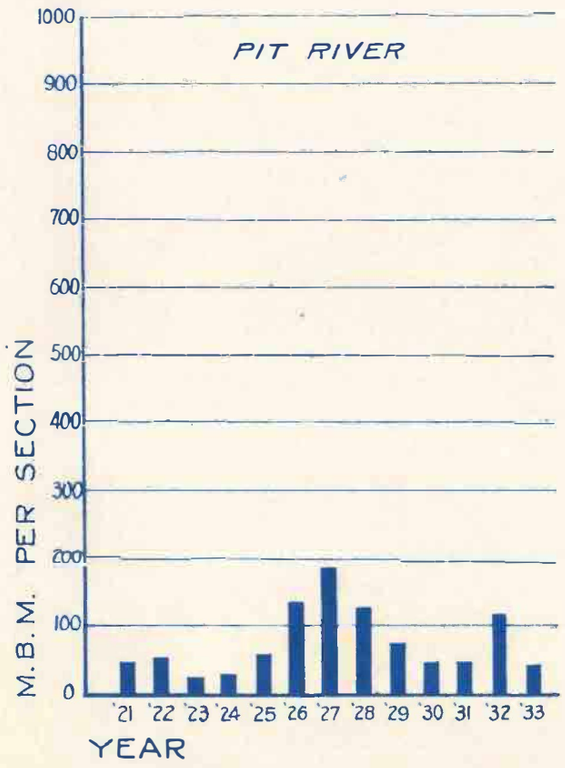
1921 - 1933

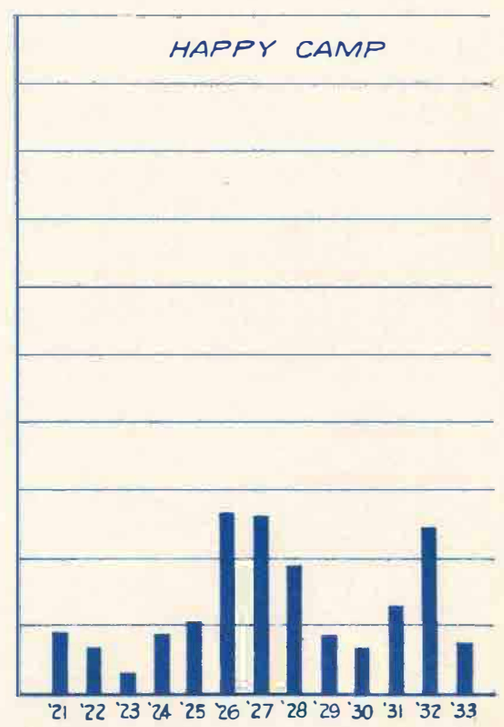
ANNUAL M.B.M. LOSS
PER SECTION - BY UNITS

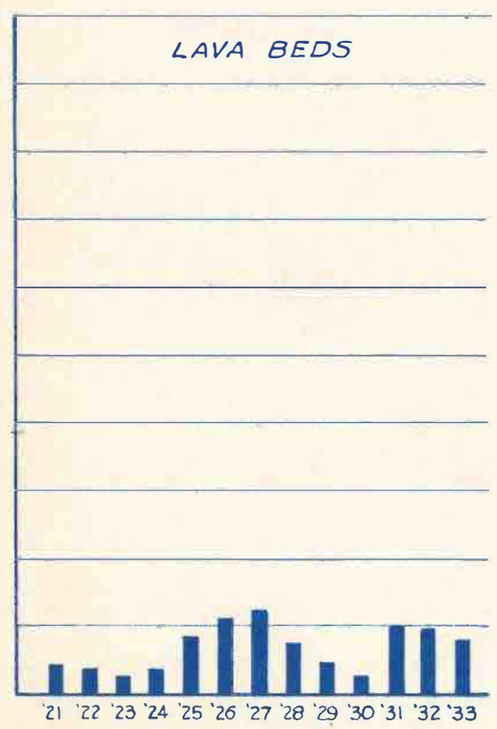


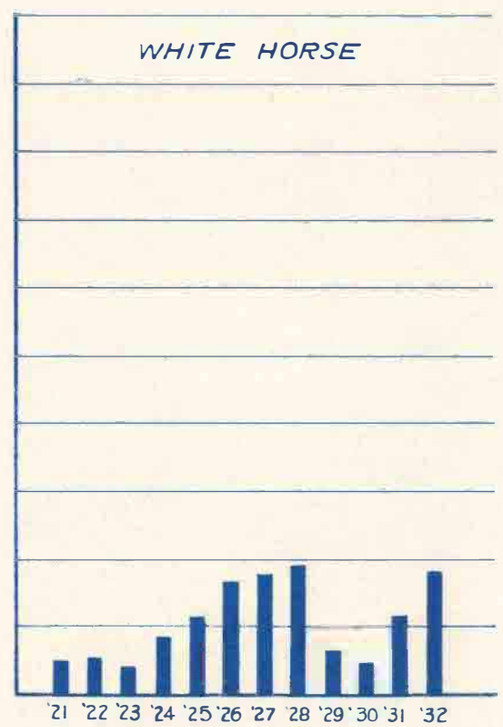












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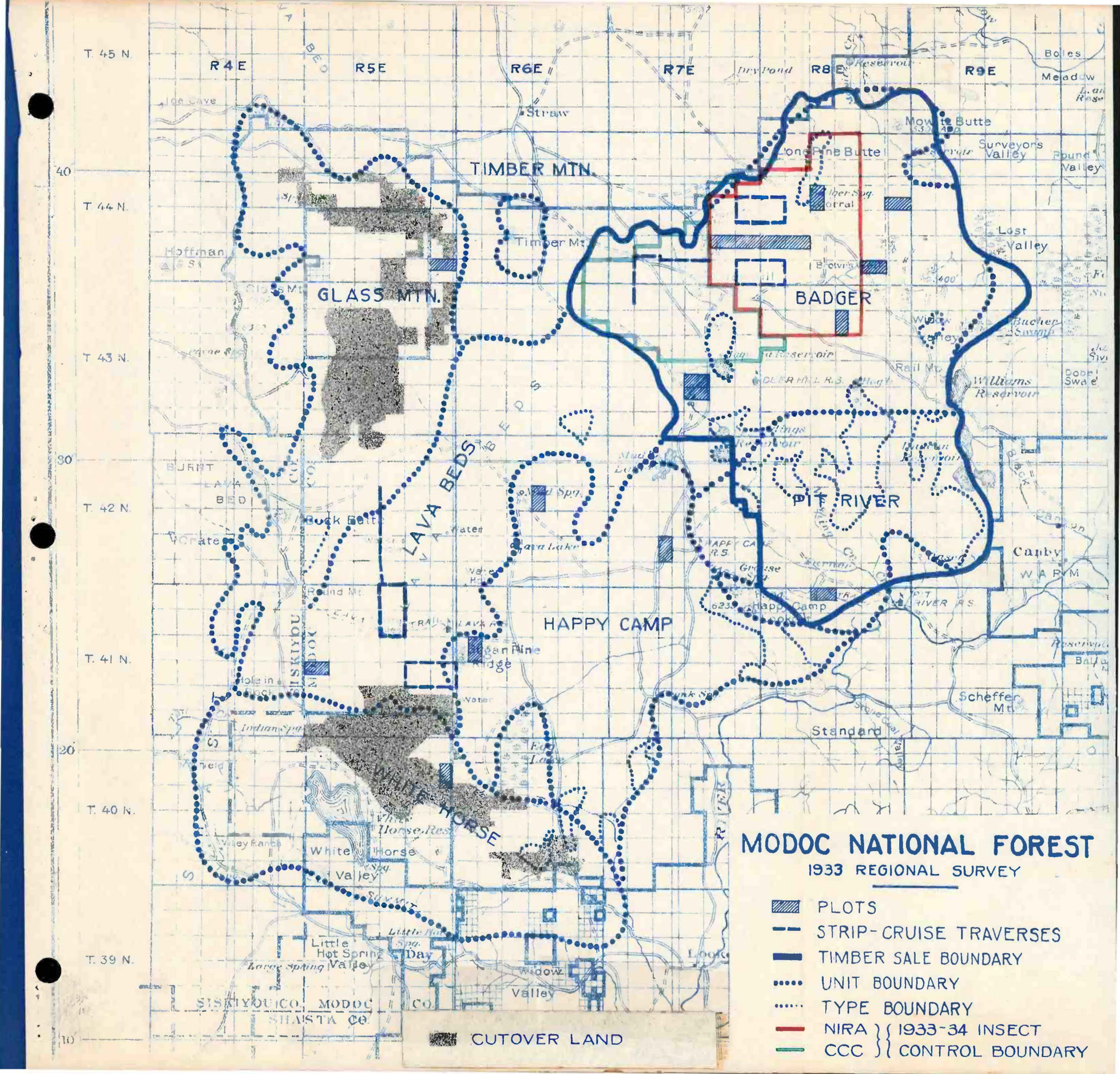
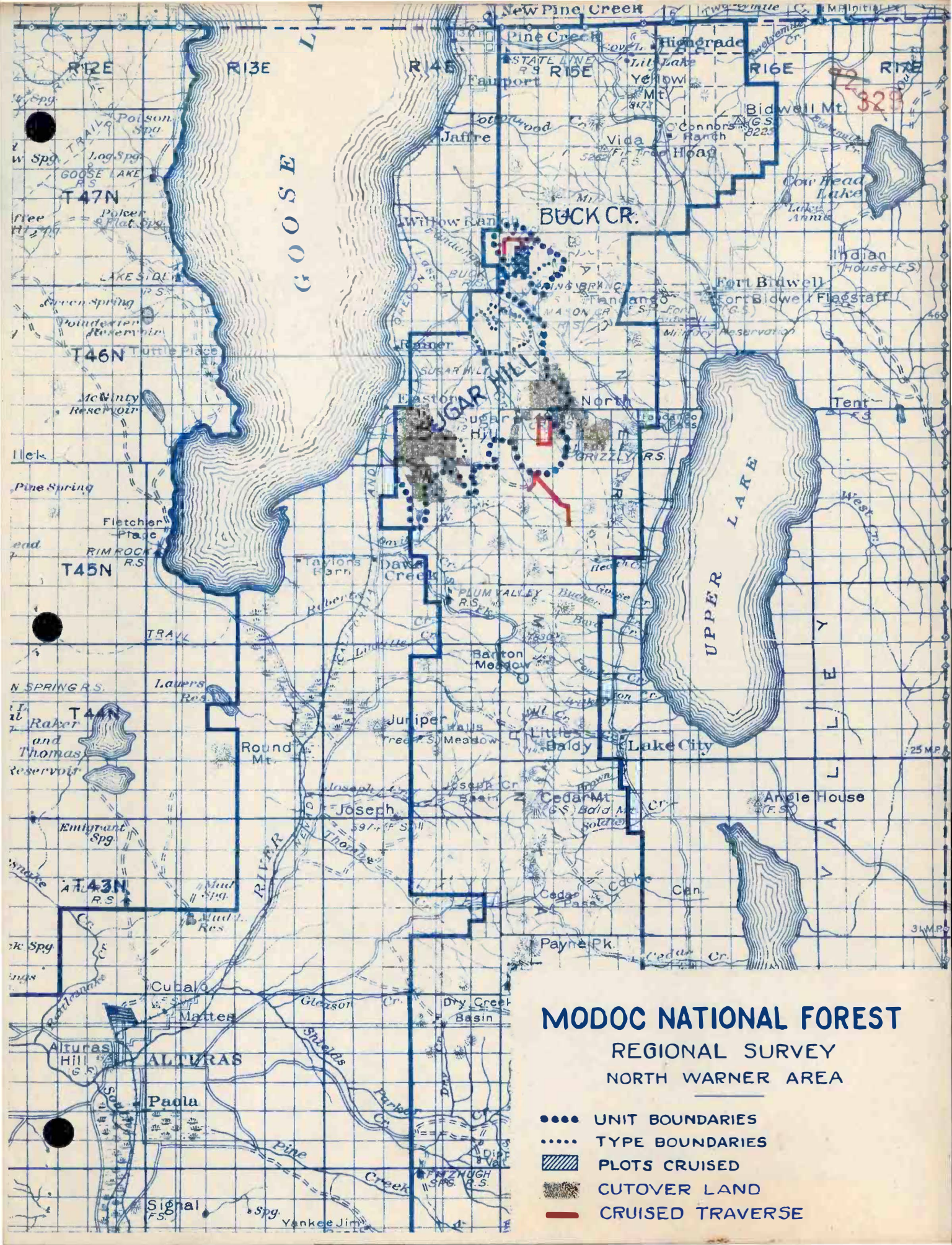

T. 45 N.
T. 44 N.
T. 43 N.
T. 42 N.
T. 41 N.
T. 40 N.
T. 39 N.
R4E
R5E
R6E
R7E
R8E
R9E
TIMBER MTN.
GLASS MTN.
BADGER
PIT RIVER
HAPPY CAMP
LAVA BEDS
WHITE HORSE
Straw
Timber Mt.
Hoffman
Lost Valley
Surveyors Valley
Round Valley
Boles Meadow
Mowitz Butte
Long Pine Butte
Dry Pond
Reservoir
Williams Reservoir
Rail Mt.
Buck Butte
Crater
Lava Lake
Round Mt.
Happy Camp
Canby
Scheffer Mt.
Standard
Hole in Ground
Indian Spg.
White Horse Res.
White Horse Valley
Little Hot Spring Valley
Day
Widow Valley
Valley Ranch
Bucher Swamp
Dobel Swale
Siskiyou Co.
Modoc Co.
Shasta Co.
MODOC NATIONAL FOREST
1933 REGIONAL SURVEY
PLOTS
STRIP-CRUISE TRAVERSES
TIMBER SALE BOUNDARY
UNIT BOUNDARY
TYPE BOUNDARY
NIRA
CCC
1933-34 INSECT CONTROL BOUNDARY
CUTOVER LAND


MODOC NATIONAL FOREST
REGIONAL SURVEY
NORTH WARNER AREA
UNIT BOUNDARIES
TYPE BOUNDARIES
PLOTS CRUISED
CUTOVER LAND
CRUISED TRAVERSE
BUCK CR.
GOOSE LAKE
UPPER LAKE
SUGAR HILL
T47N
T46N
T45N
T44N
T43N
R12E
R13E
R14E
R15E
R16E
R17E
Pine Creek
Fairport
Jaffre
Vida
Bidwell Mt.
Fort Bidwell
Indian
Tent
Lake City
Angle House
Juniper
Round Mt.
Joseph
Cedar Mt.
Payne Pk.
Cubalo
Matteo
ALTURAS
Paola
Signal
Yankee Jim
Barton Meadow
Dry Creek Basin
Pine Creek
Willow Ranch
Easton
Tangard
Fletcher Place
Taylors Harn.
Dave Creek
Laurs Res.
Raker and Thomas Reservoir
Emigrant Spg.
Mud Spg.
Mud Res.
Cedar Pass
Fitzhugh Spg.
Lookout
Grizzly R.S.
Rimrock R.S.
Plum Valley R.S.
Goose Lake R.S.
Lake Annie
Eagle Lake
Tule Lake
Klamath Falls
Lakeview
Reno
Susanville
Redding
Sacramento
San Francisco
Fresno
Los Angeles
San Diego
Las Vegas
Salt Lake City
Boise
Portland
Seattle
Spokane
Billings
Denver
Albuquerque
Phoenix
El Paso
Omaha
Kansas City
Chicago
Minneapolis
Detroit
Cleveland
Pittsburgh
Buffalo
Boston
New York
Philadelphia
Washington
Atlanta
Charleston
Jacksonville
Miami
New Orleans
Houston
Dallas
St. Louis
Memphis
Nashville
Louisville
Cincinnati
Indianapolis
Milwaukee
Des Moines
Sioux Falls
Fargo
Bismarck
Helena
Butte
Missoula
Great Falls
Cheyenne
Salt Lake City
Reno
Carson City
Virginia City
Tonopah
Las Vegas
Flagstaff
Albuquerque
Santa Fe
Amarillo
Oklahoma City
Tulsa
Little Rock
Jackson
Mobile
Montgomery
Birmingham
Atlanta
Columbia
Charleston
Raleigh
Richmond
Norfolk
Baltimore
Wilmington
Dover
Trenton
Harrisburg
Albany
Hartford
Providence
Boston
Portland
Augusta
Concord
Montpelier
Burlington
Plattsburgh
Syracuse
Rochester
Buffalo
Erie
Cleveland
Akron
Columbus
Dayton
Cincinnati
Indianapolis
Chicago
Milwaukee
Madison
Green Bay
Minneapolis
St. Paul
Duluth
Fargo
Grand Forks
Bismarck
Minot
Williston
Billings
Great Falls
Helena
Butte
Missoula
Spokane
Seattle
Portland
Eugene
Salem
Medford
Klamath Falls
Lakeview